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Gender, Intrafamily Allocation of Resources and Child Schooling in South India

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GENDER, INTRAFAMILY ALLOCATION OF RESOURCES AND CHILD SCHOOLING IN SOUTH INDIA

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Abstract

The gender differences in the determinants of child schooling are examined using household level data from rural and urban areas of south India. Two measures of child schooling, namely, school enrollment status and grade attainment, are analyzed. The empirical results suggest that the education of father and mother are the significant determinants of the schooling of their sons and daughters. Both parent's education have a bigger effect on daughter's than on son's schooling in rural areas. Distance to primary and secondary schools reduces both the enrollment rate and grade attainment. The fixed effects estimates suggest that the unobserved community specific heterogeneity in the school availability and school quality is important and failure to control for such factors leads to bias in the cross section parameter estimates of grade attainment equations.

KEY WORDS: School enrollment, determinants, India, gender differences

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I. Introduction:

Studies of gender differences in human capital investments such as health and education suggest that the gender gap in these two forms of investment is a prominent characteristic of the low income countries, particularly in South and West Asia and sub-Saharan Africa (Schultz, 1991). In India, women's literacy is one-third to two-thirds that of men, and women receive about one-third to one-half the years of schooling that men do (Tables 1 and 2). The gap between the male and female literacy rates has remained around 25 percent since 1960-61. This observed difference in the educational attainment is the result of the gender specific differences in the school enrollment rates. The enrollment rates of girls at primary, middle and secondary levels are, respectively about 71, 58 and 48 percent that of boys for the most recent year (Table 3). Although the gender gap is steadily declining at all levels, the sex differences in educational enrollment rates are quit considerable i.e. about 15 to 33 percent for the most recent year for which data are available.[1]

The gender difference in the educational attainment cannot be attributed to biological factors such as genetic endowments or to any public programs and policies. It may be due to the intrafamily distribution of educational investments. There are several reasons for the gender bias in parental resource allocation decisions. Sociologists and social demographers argue that the social considerations such as son preference and the segregated role of sons and daughters in family rituals are major factors leading to discrimination against a female child. Economists suggest that the economic factors, namely the economic returns from children (Sen and Sengupta, 1983) and the differential market returns to educational investments of boys and girls (Bardhan, 1974;

Table 1

Literacy by sex in India, 1950-51 to 1990-91

Year	Males	Females	Females-males Ratio	Females-males Difference
1950-51	27.1	8.9	0.33	-18.2
1960-61	40.4	15.3	0.38	-25.1
1970-71	46.0	22.0	0.48	-24.0
1980-81	56.4	29.8	0.53	-27.4
1990-91	63.9	39.4	0.62	-24.5

Source: U.N. (1982) for 1951-1971 (excludes population aged 0-4) Census of India, 1981, for 1981 (excludes population aged 0-4) 1991 figures are provisional (excludes population aged 0-6 and the state of Jammu and Kashmir.

Table 2

Completed Level of Education of Men and Women Aged 25 - 59, India, 1981

	Level	Male	Female	Ratio	Difference
1.	Literate below primary	10.92	4.96	0.45	-5.96
2.	Primary	15.06	7.78	0.52	-7.28
3.	Middle	9.58	3.87	0.40	-5.71
4.	Secondary	12.78	3.44	0.27	-9.34
5.	Graduate and above	4.31	1.22	0.28	3.09

Source: Census of India, 1981, Social and Cultural Tables, Table C-2.

Table 3

School enrollment rates by sex in India, 1950-51 to 1986-87

Year	Primary				Middle				Secondary			
	Boys	Girls	Ratio	Difference	Boys	Girls	Ratio	Difference	Boys	Girls	Ratio	Difference
1950-51	60.6	24.8	0.41	35.8	20.6	4.6	0.22	16.0	8.7	1.5	0.17	6.2
1960-61	82.6	41.4	0.50	41.2	33.2	11.3	0.34	21.9	18.0	4.4	0.24	15.6
1970-71	95.5	60.5	0.63	35.0	46.3	19.9	0.43	36.4	26.8	9.8	0.37	17.0
1980-81	95.8	64.1	0.67	31.7	54.3	28.6	0.53	25.7	23.1	11.1	0.48	12.0
1986-87	111.8*	79.2	0.71	32.6	66.5	38.9	0.58	27.6	29.8	14.4	0.48	15.4

Notes: * Percent exceeds 100 because of repetition by some children

Source: Education in India (various years), Ministry of Education and Culture, Government of India.

Rosenzweig and Schultz, 1982), may be important.[2]

Previous studies on the intrafamily allocation of resources are mainly confined to health and nutrition outcomes such as child survival (Rosenzweig and Schultz, 1982) and anthropometric measures (Rosenzweig and Wolpin, 1988; Behrman 1988, Thomas, 1990). One of the disadvantages of using anthropometric measures to study the gender differences in developing countries is that these health indicators are measured in relation to other population, normally the U.S. standards of a well nourished child of the same age and sex, and any unobserved gender bias in the base country's population may yield misleading conclusions (Harriss, 1989). But the child schooling measures, such as enrollment status and grade attainment for a given age can be compared between sexes.[3] One of the objectives of this paper is to study the gender differences in the intrafamily allocation of resources to child schooling.

Studies of child schooling for developing countries have mainly focused on the determinants (Birdsall (1985), Chernichovsky (1985), Jamison and Lockheed (1987), Psacharopoulos and Arriagada (1989)) and more recently on the gender specific determinants (Schultz (1988), de Tray (1988), Alderman et al. (1991), King and Bellew (1991)). The literature on child schooling is reviewed in Birdsall (1982) and more recently in Schultz (1990), and Behrman (1990). In these studies, the influence of the observed and unobserved community level factors, such as the availability and quality of schools, literacy, information etc., are either ignored or inadequately controlled.[4] These omitted and unobserved community factors are likely to be correlated with the household determinants, such as parents education, and ignoring this potential source of heterogeneity may result in misleading parameter estimates of the household determinants of child schooling (Rosenzweig and Wolpin 1988, Strauss, 1990).

The second objective of this paper is to study the gender specific differences in the schooling determinants, controlling for the omitted and unobserved differences in the availability and quality of schools across communities, using a large representative household level sample from South India. The empirical results indicate that the omitted and unobserved community factors bias the estimated effects of parents education on the investment in child educational levels.

The third objective of this paper is to explore the rural-urban differences in the gender specific determinants of child schooling.

The rest of the paper proceeds as follows. In section 2 the theoretical model and the derivation of the demand functions are discussed. The data base and the empirical specification and estimation methods are presented in section 3. In section 4 the empirical results are reported. The findings of the study are summarized in section 5.

II. Theoretical Framework

To study the intrafamily resource allocation, it may be appropriate to use the Nash-bargaining model of household behavior (McElroy, 1990). The bargaining framework recognizes the role of an individual's bargaining position within the household, measured by the person specific control over assets, on the intrafamily allocation of resources. Unfortunately few household surveys in developing countries collect detailed information on asset accumulation and ownership. The data on which this paper is based does not contain sufficient information to test the implications of the bargaining model.[5] Hence the neoclassical common preference approach is used to specify the sex specific demand functions for child schooling, although some results shed light on the

potential usefulness of extending the analysis in a more flexible individualized choice framework such as provided by the Nash-bargaining model.

The families' preference over gender specific investment in human capital of children, individual member's leisure, and other goods can be expressed by the utility function:

(1) $U = U(S, L, X)$

where S is a vector of quantities of schooling of boys (b) and girls (g), L is a vector of leisure of household members, and X is the composite consumption good. The family is assumed to maximize the utility function subject to a production function for schooling, and family budget constraints. The intrahousehold decision process results in a system of reduced form sex-specific demand functions for schooling, leisure and the composite consumption commodity. It can be shown that the reduced form for sex-specific child schooling is a function of prices of inputs to schooling (P_S), price of composite good (P_X), wages of household members (W), family full income (F) and a set of environmental variables (E), written as:

(2) $S_i = f(P_S, P_X, W, F, E)$, $i = b, g$

III. The Data, Specification and Estimation

The data used in this study come from a large sample survey on "Participation in Education" conducted by the National Sample Survey Organization (NSSO), Government of India as part of its forty-second round in 1986-87. The survey is representative of state and national populations and designed to derive estimates on school enrollment rates and private cost of education at national and regional levels. This study utilizes the data collected in one of the South Indian states namely, Tamil Nadu.

The primary sampling unit is a strata which consists of a district or part of a district with a population of 1.8 million. In each strata, the rural and urban households are selected on the basis of a two stage random sampling procedure. The first stage consists of the selection of villages and urban blocks. The sample villages were selected with populations in proportion to population size with replacement, and the urban blocks were selected by simple random sampling without replacement. In the second stage, from each of the selected villages/urban blocks, six households were chosen by circular systematic selection with a random start. Thus the survey covers 480 villages and 432 urban blocks and provides information for 2800 rural households and 2592 urban households. The entire operation of the survey was carried out by professionally trained permanent investigators and supervisors and the data were computerized by the state statistical department. Our consistency checks show that the quality of the data is exceptionally good. Village level information pertaining to the availability and distance of different types of schools, and other related educational and health services was copied from NSSO village level schedules and then merged with the individual and household records. As in other surveys for developing countries, community level characteristics were not collected for urban areas since the community level health and education services are available in all of the urban communities. The empirical analysis is restricted to school age population, namely children aged 5-18 years.[9]

The dependent variable, child schooling, is measured by the enrollment status and grade attainment (completed years of schooling). In the schooling literature, the enrollment status is measured as a dichotomous variable indicating whether the child is enrolled or not enrolled in school. Such a measure treats the decision to enter into a low quality free education public

school the same as the decision to enroll in a better quality fee paying private school. Recent studies have modelled the choice of school - private or public (Jimenez et al., 1988; Long and Toma, 1988) but have ignored the decision on grade attainment. In this study, the decision to participate in schools and the choice of school are integrated by defining the enrollment status as three categories, namely, not enrolled, enrolled in public school, and enrolled in private school. One of the limitations of the dichotomous or trichotomous characterization of the enrollment status is that it takes into account only the current decision (at the time of the survey) and ignores the cumulative performance of a child in school. The second measure of the dependent variable, namely grade attainment, is a better proxy for performance in school and cognitive achievements. One of the problems in using the completed years of schooling is that it is truncated on the right side of the distribution, since final grade attainment of a child who is still in school at the time of the survey is not known. One way to deal with this limitation is to standardize enrollment or attainment for the child's age. Alternatively, the age effect can be controlled by including the child's age as one of the explanatory variables. The latter approach is followed in this study.

The exogenous variables include a set of child level variables, namely age and its quadratic, household level variables, such as the logarithm of household expenditure per adult, the years of education of father and mother, and a dummy variable for caste. The data set contains no information on prices, wages of the household members, nonlabor income and assets. Only the landholding of the household is known. However, the survey provides information on the average monthly consumption expenditure which includes expenditure on purchased consumption goods and the value of goods used for domestic consumption from own

farm production and transfers from others. The influence of household size on household expenditure is controlled by defining household expenditure per adult. The consumption expenditures cannot be treated as an exogenous variable since consumption, leisure and time allocation to schooling and other activities are jointly determined. The area of land owned by the household is used as an identifying instrument to estimate the effect of expenditure per adult on schooling decisions. However, about 47 percent of the rural and about 85 percent of the urban sample households do not report any landholding. Additionally, dummy variables for the household's primary occupation are also included in the set of instruments. The household's primary occupation is that which provides the major source of income of the household, taking into account all members of the household.[8] The education of father and mother are also included in the set of exogenous variables to capture the effects of opportunity cost of time, information, unobserved family background etc.

Community level variables such as availability and quality of schools, presence of industry etc., will certainly influence the parents decision on child schooling. Several studies report that the school distance is a significant determinant of child schooling in rural areas of developing countries (see de Tray, 1988 for Malaysia, King and Lillard, 1987 for Philippines, Duraisamy, 1988, Duraisamy and Malathy, 1990 for India etc.,). The data set contains information only on the distance to educational and health services. Hence the distance to primary and secondary schools in rural areas are included as an additional set of regressors in the schooling equations for rural areas.[9]

The description and summary statistics of the variables are reported in Table 4. The sample means show that the gender gap in child schooling is larger in rural than in urban areas according to both measures of schooling. It should

Table 4
Variable Definition, Means and Standard Deviations

Variable	Rural		Urban	
	Boys	Girls	Boys	Girls
Child Characteristics:				
Not enrolled	0.272	0.446	0.222	0.274
	(0.444)	(0.498)	(0.415)	(0.446)
Enrolled in public school	0.618	0.469	0.487	0.449
	(0.489)	(0.499)	(0.500)	(0.498)
Enrolled in private school	0.110	0.085	0.292	0.276
	(0.312)	(0.279)	(0.455)	(0.448)
Completed years of schooling	5.103	3.933	5.775	5.534
	(3.377)	(3.309)	(3.287)	(3.352)
Age (years)	11.655	11.511	11.871	11.800
	(3.750)	(3.773)	(3.732)	(3.765)
Age square	149.900	146.720	154.840	153.400
	(87.542)	(88.056)	(88.264)	(88.527)
Household variables:				
Log consumption expenditure per adult[a]	5.127	5.163	5.410	5.428
	(0.440)	(0.443)	(0.497)	(0.505)
Father's education (years)	3.700	4.178	7.200	7.136
	(3.803)	(4.066)	(4.256)	(4.271)
Father's age (years)	44.238	44.022	44.118	43.899
	(7.880)	(7.664)	(7.680)	(7.843)
Mother's education (years)	1.826	2.078	4.601	4.529
	(3.035)	(3.114)	(4.123)	(4.074)
Mother's age (years)	36.825	36.664	36.333	36.334
	(6.999)	(6.751)	(6.645)	(7.008)
Scheduled caste and Scheduled tribes dummy	0.238	0.243	0.129	0.136
	(0.426)	(0.429)	(0.336)	(0.343)
Area of landholding (in hectares)	0.701	0.743	0.105	0.106
	(1.620)	(1.748)	(0.560)	(0.568)
Household Primary employment status:				
Wage employment	0.127	0.141	0.409	0.425
	(0.333)	(0.347)	(0.492)	(0.494)
Casual wage labor	0.405	0.393	0.187	0.178
	(0.491)	(0.489)	(0.389)	(0.383)
Self employment	0.468	0.466	0.404	0.397
	(0.498)	(0.499)	(0.490)	(0.489)
Community level variables:				
Distance to Primary school	0.159	0.182		
	(0.794)	(1.065)		
Distance to Secondary school	2.642	2.374		
	(3.398)	(3.082)		
Number of children	2442	2023	1980	1743

Standard deviation in parentheses.

be noted that about 9-11 percent of the rural children and about 28-29 percent of the urban children attend private schools.

Estimation Methods:

The enrollment status dependent variable is discrete and polytomous. The specification issue is whether to treat the three categories of the enrollment status variable as ordered or unordered. In the unordered case, the model can be specified in a multinomial logistic framework. Evidence shows that the private schools are often more effective than the public schools in improving students educational achievement (Jimenez et al. 1988). It is expected that the educational achievement of a child will be increased if enrolled in a public school rather than not being enrolled at all and will be higher in a private school than in a public school. Hence the three choices are treated as ordered categories and the ordered probit model described by Zvoina and McElvey (1975) is employed.[10] The underlying ordered specification of the model can be written as

$$(3) \quad S_{Ei} = \beta Y + Z'\gamma + e, \quad e \sim N(0,1),$$

$$S_{Ei} = 0 \text{ if } S^*_{Ei} \leq \mu_0,$$

$$S_{Ei} = 1 \text{ if } \mu_0 < S^*_{Ei} \leq \mu_1,$$

$$S_{Ei} = 2 \text{ if } S^*_{Ei} > \mu_1$$

where S^*_{Ei} is the latent variable of school achievement, S_{Ei} is the observed counterpart of S^*_{Ei}, Y is consumption expenditure per adult potentially correlated with the error term, Z is the set of exogenous variables, β and γ are vectors of parameters, μ_i is the threshold value, and e is the disturbance vector. This specification of the ordered model is estimated by maximum likelihood ordered probit method. One of μ_i is not identified since the β's include a constant term. The first threshold parameter, μ_0 is normalized to zero

and μ_1 is estimated as $\mu_1 - \mu_0$. The marginal effect of an exogenous variable on choosing alternative j can be calculated as

(4) $\partial \text{Prob}[S_{Ei}=j]/\partial X_i = [\phi(\mu_{j-1} - X'\theta) - \phi(\mu_j - X'\theta)]\theta$

where $\phi(.)$ is probability density of standard normal variable, X = [Y Z] and $\theta=[\beta\ \gamma\ ]$.

The specification for the grade attainment dependent variable can be written as

(5) $S_{Cij} = \beta Y_{ij} + Z'_{1ij}\gamma_1 + Z'_{2j}\gamma_2 + u_{ij}$, i = 1,...,N; J=1,...,J

(6) $u_{ij} = \alpha_j + \varepsilon_{ij}$

where N is the number of individuals, J is the number of communities (villages and urban blocks), α is the unobserved community specific effects and ε is the random disturbance term. The exogenous variables, Z, consists of a set of child and household specific variables (Z_1) and community specific observed school distance variables (Z_2). Assuming $u_{ij} \sim N(0,1)$, the above specification of the model can be estimated by Two Stage Least Squares (TSLS) method.[11] However, in the presence of community-specific factors such as school quality, general literacy, presence of industry, etc., affecting parental decisions but unobserved by the researcher, the cross sectional estimates may yield misleading results on the effects of household variables. Consideration is therefore given to alternative estimation methods, namely community fixed effects (FE), random effects (RE) and between (B).[12] The parameters of the fixed effects and between specifications of the models are estimated by TSLS method and the random effects model is estimated by generalized TSLS. If α's are uncorrelated with the regressors, then the random effects yields consistent and asymptotically efficient estimates. On the other hand, if α's are correlated with the regressors, both the random effects and between estimates are biased and

inconsistent. In that case, fixed effects are more appropriate which yields consistent but not efficient estimates. From the three estimators for β and γ, following Hausman (1978) and Hausman and Taylor (1981), three specification tests are constructed as follows: Let

$q_i = (\theta_j - \theta_k)$ and the variance-covariance of q_i, $cov(q_i) = cov(\theta_j) - cov(\theta_k)$, for i=1, j=RE, k=FE; for i=2, j=RE, k=B; for i=3, j=FE, k=B and $cov(-\theta_W)$. Hausman and Taylor (1981) showed that the test statistics (χ^2) for the three tests are numerically exactly identical.

IV. Results

(A) Participation and Choice of School:

The maximum likelihood estimates of the ordered probit model of the child enrollment status equations are presented in Tables 5. The estimates of the threshold parameter, μ, in the enrollment equations are positive and also statistically significant in all the equations, confirming the plausibility of the ordered specification. The null hypothesis that there is no difference in the parameter estimates of boys and girls in enrollment equations ($\chi^2 = 249.0$ for rural and $\chi^2 = 19.0$ for urban) is rejected at the 5 percent level. This implies that the effects of the determinants of schooling differ by sex in rural and urban areas.

The parameter estimates of child age is positive and age square is negative and also statistically significant at 1 percent level in all the equations. The results suggest that the enrollment rates reach the peak among children of about age 10, when many children in the sample complete the primary level schooling. The direct and indirect costs of secondary schools are much higher than those of primary schools since there is no free school lunch program at secondary level and the opportunity cost of student time also increases.[14]

Table 5

Maximum Likelihood Ordered Probit Estimates of Child School Enrollment in Rural and Urban Households of Tamil Nadu, India, 1986-87

	Rural				Urban	
	Boys		Girls		Boys	Girls
Constant	-4.802	-4.936	-2.530	-2.641	-3.948	-5.038
	(3.40)	(4.09)	(2.11)	(2.19)	(3.42)	(4.02)
Child Characteristics:						
Child age	0.457	0.459	0.489	0.486	0.486	0.357
	(11.723	(11.74)	(9.33)	(9.28)	(10.79)	(7.49)
Child age square	-0.0217	-0.0218	-0.0269	-0.0268	-0.0231	-0.0182
	(12.33)	(12.33)	(11.02)	(11.00)	(11.26)	(8.51)
Household variables:						
Log consumption expenditure per adult[a]	0.608	0.638	0.109	0.149	0.364	0.687
	(2.62)	(2.75)	(0.46)	(0.63)	(1.61)	(2.83)
Father's Education	0.0527	0.0511	0.0663	0.0634	0.0651	0.0600
	(5.94)	(5.75)	(6.47)	(6.24)	(6.36)	(5.56)
Mother's Education	0.0562	0.0548	0.0703	0.0685	0.0508	0.0420
	(5.35)	(5.21)	(6.04)	(5.91)	(5.44)	(4.23)
Caste	0.0395	0.0476	-0.0394	-0.0256	-0.0217	-0.0580
	(0.66)	(0.79)	(0.57)	(0.37)	(0.24)	(0.60)
Community variables:						
Distance to primary school		-0.0436		-0.0522		
		(2.02)		(1.64)		
Distance to secondary school		-0.0102		-0.0262		
		(1.33)		(2.48)		
μ Threshold value	2.084	2.086	1.828	1.836	1.593	1.458
	(47.39)	(47.40)	(37.35)	(37.11)	(36.47)	(33.31)
Log likelihood	-1930	-1927	-1541	-1535	-1774	-1588
No. of children	2442	2442	2023	2023	1980	1743
Endogeneity test ('t')	-2.03	-2.24	0.439	0.198	1.69	1.85
Ho: No difference in effect of school enrollment: by sex (χ^2_7)		253.6			19.0	

Asymptotic 't' ratios are in parentheses

a. Endogenous variable.

The household consumption expenditure per adult is positively associated with child schooling. The Hausman (1978) endogeneity test statistics, reported in the bottom of tables 5, suggests that the error term is correlated with the consumption expenditure per adult variable in the equations for rural boys and urban boys and urban girls.

The education of both parents have positive and statistically significant (at 1 percent level) effects in all equations. The marginal effects of the education of father and mother on the schooling alternatives are computed and presented in Table 6. An additional year of schooling of both parents reduces the probability of being not enrolled in any school by about 2-3 percent and increases the probability of being enrolled in a private school by 1-2 percent. In urban areas, educated parents choose more often private schools rather than public schools. The mother's education has bigger effect on the enrollment rates of both boys and girls in rural areas whereas the father's education has bigger effect on the school enrollment rates in urban areas. The results do not show any evidence of different sex preference in enrollment rates of fathers and mothers by the child's gender (Behrman et al. 1986).

The distance of both primary and secondary schools from the village are inversely related to the enrollment. The results suggest that the availability of schools nearer to the village is an important consideration when parents in rural areas decide whether or not to send their children to school, particularly in sending their daughters to secondary schools. One kilometer more distance to primary school reduces the probability that a daughter attends school by 2 percent in a rural family. The interaction effects of father's and mother's education with the distance to primary and secondary schools are not statistically significant.

Table 6

Marginal Effects of Parents Education on Child School Enrollment Rates[a]

Variable	Not Enrolled	Public School	Private	Not Enrolled	Public School	Private
		Rural-Boys			Rural-Girls	
Father's Education	-0.0161	0.00839	0.00768	-0.0251	0.0192	0.00591
Mother's Education	-0.0172	0.00901	0.00824	-0.0271	0.0207	0.00638
Distance to Primary school	0.0137	-0.00717	-0.00655	0.0207	-0.0158	-0.00487
Distance to Secondary school	0.00322	-0.00168	-0.00153	0.0104	-0.00793	-0.00244
		Urban-Boys			Urban-Girls	
Father's Education	-0.0172	-0.00339	0.0206	-0.0185	0.00388	0.0181
Mother's Education	-0.0134	-0.00264	0.0160	-0.0278	0.0211	0.0127

a. Marginal effects are calculated from the ordered probit coefficients corresponding to the specification which excludes the school distance variables in Table 5.

(B) Grade attainment:

The parameter estimates of the sex-specific grade attainment equations for rural and urban areas, obtained using the two stage least squares (TSLS), the two stage least squares fixed effects and between estimates, are reported in Tables 7 and 8 respectively. The last rows of tables 7 and 8 present the specification test statistics. By comparing the cross section individual levels (TSLS), Two stage fixed effects, and Two stage between estimates, we can gain some insight into the effects of the determinants of schooling and whether purging intracommunity variances and controlling for unobserved community heterogeneity changes the estimated impact of child and household characteristics on grade attainment.

The null hypothesis that there is no community-specific unobserved heterogeneity is rejected at 1 percent level by Breusch-Pagan (1980) Lagrange multiplier test in each of the equations estimated. The Hausman (1978) specification test statistics, comparing the three models, is statistically significant at 5 percent level in all the equations.[15] This implies that the unobserved community specific heterogeneity (α) is correlated with the regressors in the grade attainment equations and the appropriate model is that which allows for community fixed effects model.

The results in general confirm the earlier findings using the school enrollment status dependent variable. The completed years of schooling of both boys and girls increases at a decreasing rate with age. Household expenditure per adult significantly influences the grade attainment in urban areas, whereas being from a scheduled caste reduces grade attainment in rural areas. Both parents education significantly increases the schooling of their sons and daughters. However father's education has much bigger marginal effect than

Table 7

Two Stage Least Squares, Community Fixed Effects and Between Estimates of Completed Years of Schooling of Children in Rural Households of Tamil Nadu, India, 1986-87

	Rural - Boys			Rural - Girls		
	TSLS	Fixed	Between	TSLS	Fixed	Between
Constant	-9.850		-14.801	-9.080		-9.833
	(4.06)		(3.62)	(3.44)		(1.77)
Child Characteristics:						
Child age	1.657	1.690	1.639	1.577	1.649	1.193
	19.90)	(18.76)	(8.08)	(14.66)	(14.71)	(4.34)
Child age square	-0.0458	-0.0483	-0.0395	-0.0520	-0.0567	-0.0307
	12.16)	(11.87)	(4.47)	(10.57)	(11.20)	(2.47)
Household variables:						
Log consumption expenditure per adult[a]	0.406	0.153	1.218	0.306	-0.0822	0.707
	(0.86)	(0.29)	(1.68)	(0.58)	(0.15)	(1.14)
Father's Education	0.122	0.103	0.117	0.174	0.200	0.155
	(7.18)	(5.03)	(3.78)	(8.51)	(8.28)	(3.97)
Mother's Education	0.0615	0.0367	0.0885	0.176	0.119	0.242
	(2.89)	(1.31)	(2.65)	(7.39)	(3.93)	(5.56)
Caste	-0.125	-0.522	0.167	-0.264	-0.438	-0.214
	(1.03)	(2.86)	(0.94)	(1.84)	(2.04)	(0.96)
Community variables:						
Distance to primary school	-0.108		-0.0464	-0.0304		-0.0386
	(1.73)		(0.68)	(0.55)		(0.44)
Distance to secondary school	-0.0342		-0.0208	-0.489		-0.0424
	(2.31)		(1.18)	(2.46)		(1.65)
Sample size	2442	451		2023	429	
$\sigma^2_\alpha/(\sigma^2_\alpha+\sigma^2_\varepsilon)$		0.188			0.0734	
Breusch-Pagan Test (χ^2_1)		19.581			27.825	
Hausman Test (χ^2_6):		17.321			23.105	

Asymptotic 't' ratios are in parentheses
a. Endogenous variable.

Table 8

Two Stage Least Squares, Community Fixed Effects and Between Estimates of Completed Years of Schooling of Children in Urban Households of Tamil Nadu, India, 1986-87

	Urban -Boys			Urban - Girls		
	TSLS	Fixed	Between	TSLS	Fixed	Between
Constant	-5.493		-6.376	-12.478		-7.797
	(3.15)		(2.71)	(5.65)		(1.92)
Child Characteristics:						
Child age	1.332	1.382	1.157	1.191	1.235	1.148
	(18.12)	17.33)	(6.31)	((13.26)	12.64)	(5.39)
Child age square	-0.0270	-0.0301	-0.0174	-0.0208	-0.0235	-0.0180
	(8.16)	(8.54)	(2.03)	(5.15)	(5.36)	(1.84)
Household variable:						
Log consumption expenditure per adult$_a$	-0.269	-0.920	0.0233	1.160	1.282	0.290
	(0.79)	(2.10)	(0.46)	(2.70)	(2.48)	(0.36)
Father's Education	0.100	0.0955	0.0848	0.0630	0.0708	0.0671
	(6.19)	(4.99)	(2.67)	(3.25)	(3.18)	(1.75)
Mother's Education	0.0798	0.0871	0.0914	0.0902	0.0746	0.121
	(5.52)	(4.54)	(3.87)	(4.99)	(3.16)	(4.32)
Caste	0.0155	-0.289	-0.0497	-0.0527	0.189	-0.186
	(0.12)	(1.20)	(0.28)	(0.33)	(0.66)	(0.76)
Sample size	1980	391		1743	379	
$\sigma^2_\alpha/(\sigma^2_\alpha+\sigma^2_\varepsilon)$		0.0203			0.0225	
Breusch-Pagan Test (χ^2_1)		10.803			9.210	
Hausman Test (χ^2_6):		12.903			13.706	

Asymptotic 't' ratios are in parentheses
a. Endogenous variable.

mother's education. As observed in the enrollment status estimation, there is no evidence for different sex preference on the part of fathers and mothers in this study.

Comparing the parameter estimates of TSLS and fixed effects methods suggests that the coefficients for parental education and child age are quite similar. The effect of caste turns out to be not significant in all three estimation methods. Fixed effect results suggest that the effect of mother's education is overestimated in the subsamples except for urban boys. This implies that the unobserved community factors are correlated with mother's education and part of the community effect is captured through mother's schooling in the TSLS estimates.

V. Conclusions

The gender specific differences in the determinants of child schooling are examined using a large representative sample of household level data from rural and urban areas of south India. Two measures of child schooling, namely school enrollment status and grade attainment, are analyzed. The parent's decision concerning their children's school enrollment and choice of school is modelled in a ordered probit framework. The grade attainment equation is estimated using alternative methods and the importance of omitted and unobserved community specific heterogeneity in school availability and quality on child schooling is also examined.

The empirical results suggest that the child school enrollment increases at a decreasing rate with age. The enrollment rate reaches a peak among children at age 10. The education of father and mother are the significant determinants of the schooling of their sons and daughters. An additional year of schooling of father or mother reduces the probability of being not enrolled in schools by

2-3 percent and increases the probability of being enrolled in a private school by 1-2 percent. Mother's education has a bigger effect on the probability of child school enrollment in rural areas whereas father's education has a bigger effect on the school enrollment in urban areas. The results indicate that both parents' education have a bigger effect on daughter's than on son's schooling in rural areas. One kilometer increase in the distance to primary school reduces the probability that a daughter attends school by two percent and similar increase in the school distance reduces boys school enrollment by only one percent. Comparing the parameter estimates of grade attainment equations from alternative estimation methods using Hausman specification test, it is found that the bias due to the unobserved community specific heterogeneity in school availability and school quality is important and failure to control for this factor leads to bias in the cross section parameter estimates in the grade attainment equations.

Footnotes

1. Several studies report evidence on the gender difference in child survival (Bardhan 1974, Rosenzweig and Schultz 1982), malnutrition and morbidity (Sen 1984, Sen and Sengupta 1983), allocation of nutrients (Behrman and Deolalikar 1989), utilization of medical facilities (Kynch and Sen 1983) in the Indian context.

2. In countries where most schools are single sex, as in rural Pakistan, gender differences in the availability and quality of schools also cause gender gap in human capital investment (Alderman et al. 1991). In India, schools are separated by sex if there is more than one school in the same locality.

3. The problem in using child schooling measures is that these indicators are observed only for children aged 5 years and above and the schooling attainment cannot be observed for children which still in school.

4. Some of the studies control for the availability of schools by including a dummy variable indicating whether a school is available in the village (Moock and Leslie, 1986 etc.,) or by including distance of the household from the school (Duraisamy, 1988). Birdsall (1985) includes a set of variables such as average years of schooling of local teachers and average local teacher payments per child to control for quality of schooling. None of the studies, except Birdsall (1988) control for the quality of schools. Behrman and Wolfe (1987) control for unobserved family background characteristics using adult sisters sibling data. None of the studies on child schooling control for unobserved heterogeneity in the availability and quality of schools between communities.

5. In another study (Duraisamy, 1991) the implications of the bargaining model on the household decision on child schooling and other health outcomes are tested using data for the same study regions as in this paper.

6. In India, the school education system varies from state to state since education until recently has been under state control. Now it is under concurrent (both state and federal governments) list. In Tamil Nadu, the school education is divided into four levels namely primary (1-5 standards), middle (6-8 standards), secondary (9-10 standards) and higher secondary (11-12 standards). There is no middle schools but the middle level schooling is mostly offered in the secondary schools and rarely in primary schools. Most of the secondary schools include higher secondary education. The official age at entry into primary schools is five. However some children start schooling early and spend one or two years in kindergarten before entering into primary level.

7. Birth order is included both as a continuous and a dummy variable and the effect is not statistically significant in any of the equations.

8. Excluding primary occupation of the household in the predicting equation leads to imprecise estimates. Since the coefficient of log consumption expenditure per adult is not statistically significant in most of the equations, there will not be any bias in other parameter estimates by including primary occupation of the household as one of the identifying instruments.

9. Other community level variables such as distance to public library, adult literacy center, various types of health centers such as family planning center, dispensary, hospital etc., and the distance to community radio and TV are also considered. However, due to high correlation between the health centers and educational service variables only the two school distance variable are included in the final estimates.

10. The results of the multinomial logit model are not different from the ordered probit in terms of the sign and significance of the exogenous variables in the model.

11. The grade attainment may be truncated since 18 percent of the rural children and 7 percent of the urban children did not complete any grade. However the parameter estimates based on the two stage Maximum Likelihood Tobit are not different from the estimates obtained from the Two Stage Least Squares (TSLS) method and hence only the TSLS results are reported.

12. Due to the discrete and unbalanced nature of the school enrollment status variable, the within and between models are not estimated for enrollment status measure of the schooling dependent variable.

13. There are two other potential sources of heterogeneity - child specific and household specific. Although it is possible to control the household heterogeneity not child specific heterogeneity using the data at our hand, the household fixed effects method swaps all household level variables such as education of father and mother which are important. In this study I concentrate on the unobserved community heterogeneity in school service.

14. Tan and Mingat (1989) suggest that the academic performance, in addition to the higher cost of secondary education, is an important factor for the higher dropout rate in the middle level of schooling. It should be noted that the transition rate of girls to middle school is lower than boys in India.

15. The computed values of q_1, q_2 and q_3 differed only in decimal part due to the computational approximations.

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